United Nations A/AC.105/704

General Assembly

Distr.: General
23 September 1998

Original: English

Committee on the Peaceful Uses of Outer Space

Report on the Eighth United Nations International Training Course on Remote Sensing Education for Educators

(Stockholm and Kiruna, Sweden, 4 May-12 June 1998)

I. Introduction

A. Background and objective

1. The Eighth United Nations International Training Course on Remote Sensing Education for Educators, held in Stockholm and Kiruna, Sweden, from 4 May to 12 June 1998, was organized by the United Nations Programme on Space Applications/Office for Outer Space Affairs in co-operation with the Government of Sweden. The course was conducted specifically for the benefit of educators from developing countries with the objective of enabling them to introduce remote sensing courses in their respective academic institutions. It was co-sponsored by the Swedish International Development Agency (SIDA) on behalf of the Government of Sweden and was hosted by the Department of Physical Geography of Stockholm University, in Stockholm, and the Swedish Space Corporation (SSC) Satellitbild, in Kiruna.

2. The present report describes the organization of the training course, its technical contents, the results of the course evaluation and follow-up actions. It has been prepared for the Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee. The participants have reported on the knowledge acquired and on the work carried out during the course to the appropriate authorities of the Government, universities and research institutions in their own countries.

B. Organization and programme

3. Application forms for and information brochures on the training course were sent out in November 1997 by the Office for Outer Space Affairs of the Secretariat to offices of the United Nations Development Programme in developing countries for transmission to the relevant national authorities. The same materials were also distributed simultaneously to relevant Swedish embassies and to previous course participants for circulation in their academic institutions. One hundred and twenty-seven completed applications were subsequently received and processed jointly by the Office for Outer Space Affairs and the University of Stockholm. The selection of participants was completed by the end of February 1998.

4. Twenty-six candidates, nine of whom were women, were selected as participants. Because of unforeseen personal circumstances, two selected candidates cancelled their participation in the training programme a few days

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before the start of the course. The 24 participants were nationals of the following countries: Brazil, Chile, Colombia, Costa Rica, Eritrea, Ethiopia, Haiti, Kenya, Lao People's Democratic Republic, Nepal, Nigeria, Sri Lanka, Swaziland, Thailand, Uganda, United Republic of Tanzania, Venezuela and Zambia. Funds for the international travel of 12 participants were provided from the fellowship budget of the United Nations Programme on Space Applications. All other support, including the cost of international travel of the remaining 12 participants, room and board, course materials and inland transport for all the 24 participants, was provided by the Government of Sweden.

5. Course instructors and speakers came from several institutions, including the Office for Outer Space Affairs, the European Space Agency (ESA), SIDA, the University of Stockholm, the Swedish Royal College of Technology, Uppsala University, the Swedish National Space Board, the National Land Survey of Sweden, the Environmental Satellite Data Centre, L & L Monitor AB and SSC Satellitbild.

II. Summary of the contents of the course

6. The technical contents of the course were determined by the Department of Physical Geography of the University of Stockholm, with input from the Office for Outer Space Affairs. The course was modular in format and consisted of a series of lectures and office and field exercises. A more detailed summary of the contents of the course can be found in the report on the fifth course in the series (A/AC.105/617).

7. The first technical module of the course lasted three days and dealt with the fundamental principles of remote sensing. The principal topics covered were the following: electromagnetic radiation, the reflective properties of various types of materials on the surface of the Earth and elementary optics; electronic imaging; georeferencing of objects in the field, on maps and on satellite imagery; and Earth resources and environmental satellites.

8. Five days were subsequently devoted to image interpretation and presentations on the following subjects: remote sensing for land use planning and environmental monitoring; remote sensing for geological studies; introduction to visual interpretation; and in-service training in developing countries.

9. To reinforce the understanding of the principles of image interpretation, participants were divided into groups on a regional basis; each group studied a case where visual interpretation of satellite images played a key role. These case studies were land and water development in Ethiopia; land use mapping in the United Republic of Tanzania; forestry in Ecuador; geological applications in Central America; an environmental impact assessment of the closure of a river arm in Bangladesh; and an environmental impact assessment of hydropower development in the Lao People's Democratic Republic. The results of a case study on land degradation and soils in Lesotho were also presented to all the participants.

10. An additional series of lectures dealt with digital image analysis and geographic information systems (GIS). That aspect of the programme lasted six days and covered the following subjects: digital analysis (theory); computer image enhancement (theory); GIS theory; and digital image-processing techniques, including computer-aided analysis, GIS applications, CD-ROM data capture, compass techniques and global positioning systems (GPS).

11. The participants were also introduced, over a period of four days, to the principles of radar image formation and the use of such images in various development and research applications. In addition, they were introduced to the use of appropriate procedures for the field verification of interpretations of remotely sensed data using satellite images of the Skinnskatteberg area in southern Sweden.

12. The following part of the course was held in Kiruna, at the facilities of SSC Satellitbild. Four days were reserved for visual interpretation exercises and presentation of results. Wherever possible, those exercises were carried out on images selected by the participants of areas of their countries with which they were familiar. Lectures were also presented on the following subjects: archiving, catalogue updating and standard production of images; image processing, value-added production, radiometric and geometric corrections, digital elevation model (DEM) production and other image production; computerized cartography; standard and higher-level processed imagery; and future Earth resource satellites.

13. While in Kiruna, the participants made technical visits to a number of sites of interest, including the ESA/Salmijärvi and Esrange satellite receiving stations and the Kirunavaara underground mine. Lectures were supplemented by tours of the production facilities of SSC Satellitbild.

14. The final part of the course concerned the development of remote sensing curricula and was held over a period of two days in Stockholm at the Department of Physical Geography. This was followed by a half-day session reserved for formal evaluation of the course.

15. During the course, all participants made presentations relating to the state of development of remote sensing in their respective countries.

III. Course evaluation

16. Participants made a formal presentation of their evaluation of the course to representatives from the Office for Outer Space Affairs, SIDA, the Department of Physical Geography of the University of Stockholm and several selected course lecturers. Discussions following the formal presentation made by a representative of the participants of the course allowed additional inputs to be made by all participants.

17. A summary of the opinions of the participants extracted from their 24 completed questionnaires are as follows: (a) 71 per cent thought the course was right in length; (b) 21 per cent found the schedule too heavy; (c) 62 per cent found that the theoretical training corresponded to their professional needs to a large or very large extent, compared with 67 per cent for the practical training; (d) 75 per cent found the overall level of the programme to be adequate from their personal professional point of view; (e) 42 per cent found that there were subjects not adequately covered in the programme, with most of them indicating digital techniques as being one such subject; (f) 79 per cent found the methods of instruction to be good or very good; and (g) 79 per cent thought that they would have an opportunity to apply the newly acquired knowledge and experience in their present employment to a great or very great extent.

IV. Follow-up action

18. Following a proposal discussed at the Seventh United Nations International Training Course on Remote Sensing Education for Educators (1997), an evaluation workshop is to be held in Gaborone from 18 to 21 October 1998 with the primary aim of evaluating the impact of the United Nations/Government of Sweden series of training courses on remote sensing education for educators, held annually in Sweden since 1990 (except in 1991), and also of determining the future direction of the course. The workshop is being organized and funded by the United Nations Programme on Space Applications/Office for Outer Space Affairs, SIDA and the Department of Physical Geography of the University of Stockholm. Up to 45 academic-level teachers, mostly from African countries, who attended the training courses between 1990 and 1996 will participate in the workshop and their experiences will constitute a major input to the final outcome of the evaluation exercise.